Navy Evaluates Cornstarch as an Alternative Blast Media

Results from First Demonstration Are Encouraging

Engineers from the Naval Air Depot (NADEP) Cherry Point, NC have just completed a demonstration of cornstarch (eStrip™ GPX) as a blast media on aircraft components and the results are encouraging.

The current coating removal process in the U.S. Navy for most composite substrates involves sanding with pneumatic tools. The sanding process is labor intensive and can result in damage to the underlying substrate. Blasting of these surfaces with plastic media (Type V acrylic) can also lead to damage if parameters such as composite thickness, blast pressure, standoff distance, and impingement angle are not closely monitored during the process. (NOTE: See table at right for a listing of all media types approved for use.) A more forgiving (and environmentally benign) media is needed for coating removal utilizing abrasive blasting, where the expertise of the artisan is not as critical when processing sensitive composite materials.

Alternate media have been developed for abrasive blasting composite substrates, such as wheat starch. From previous studies, wheat starch did prove to be less aggressive on composite substrates than acrylic media. Wheat starch is

Types of Media for the Removal of Organic Coatings

At the present time, the Navy has approved eight different types of media for the removal of organic coatings.

Type	Description
Type I	Polyester (Thermoset)
Type II	Urea Formaldehyde (Thermoset)
Type III	Melamine formaldehyde (Thermoset)
Type IV	Phenol formaldehyde (Thermoset)
Type V	Acrylic (Thermoplastic)
Type VI	Poly (allyl diglycol carbonate) (Thermoset)
Type VII	Starch-g-acrylic
Type VIII	Fiber reinforced Nanocomposite (Thermoset)

The development of cornstarch media has produced a media comparable in performance to wheat starch, yet moisture resistant.

Cornstarch blast media.
Photo by Joe Ferguson.

extremely moisture absorbent and therefore requires special handling and storage. The development of cornstarch media (eStrip™ GPX) has produced a media comparable in performance to wheat starch, yet moisture resistant.

Personnel from the U.S. Coast Guard's Aircraft Repair and Supply Center in Elizabeth City, NC are currently using an alternate blast media (eStrip™ GPX) for all blasting operations involving coating removal, including complex composite components. This media is qualified to MIL-P-85891, Type VII. The manufacturer, ADM/Ogilvie, and distributor, Midvale Environmental Technologies, provided a demonstration at NADEP Cherry Point to demonstrate the effectiveness of eStrip™ GPX media in removing coatings from various composite substrates without damaging the underlying substrate. These composite substrates included carbon-epoxy, fiberglass, and aramid (Kevlar®) substrates.

The intent of the demonstration was to illustrate the effectiveness of the media at removing various coatings without damaging the composite substrate, to determine the strip rate of the eStrip™ GPX media for various coatings and substrates, and to compare the advantages and disadvantages of blasting with eStrip™ GPX media vs. sanding on composite substrates.

Initial blasting during the demonstration included the coating removal of composite components currently processed with Type V media to establish a baseline for strip rate and removal effectiveness. Carbon-epoxy composite materials with thicknesses greater than 0.073 inches can be blasted with Type V media. eStrip™ GPX media strip rates varied between 0.3 and 0.8 square feet per minute. This is a slower strip rate than that achieved using Type V media but all surfaces were free from damage.

The next step of the demonstration was to blast composite components normally processed by sanding. An H-53 engine cowling was blasted with no damage to the fiberglass substrate. (See Figure 1.) An estimated 8-hour sanding job could potentially be replaced with an hour-long abrasive blasting job. Also, corners from raised stringers are not easily accessed with powered sander bits and these areas of the cowling are thinner and more susceptible to damage. Extreme care was taken not to damage the substrate because most of these areas are resin insufficient or resin-starved. Blasting with eStrip™ GPX media appears to be a viable alternate process to remove paint from these components without inducing damage to the substrate.

FIGURE 1. Fiberglass H-53 engine cowling.

Engineers from NADEP Cherry Point are encouraged by the results of this first demonstration of eStrip™ GPX on naval aircraft components.

FIGURE 3. Fiberglass AV-8 radome after blasting to reveal suspect damaged areas.

The second component evaluated for coating removal was made from an aramid (Kevlar®) composite. (See Figure 2.) Most of the surface was removed undamaged, however some areas did break the outer fiber layer or fuzz from blasting due to dwell time and/or areas of insufficient resin on the exterior laminate surface of the component. Fuzzing is a condition commonly seen during sanding operations because control is difficult.

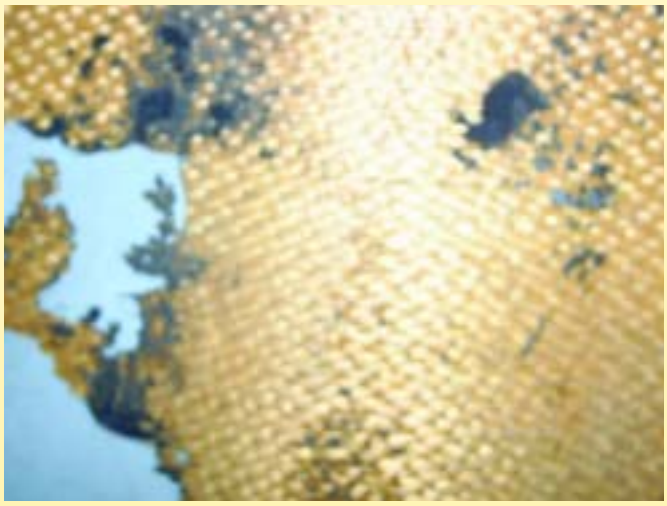

FIGURE 2. Aramid component after blasting with eStrip™ GPX.

A propeller spinner consisting of fiberglass over a conductive wire matrix was also stripped using eStrip™ GPX media during this demonstration. Similarly, no damage was incurred except on resin-starved areas.

Finally, a damaged AV-8 radome taken from the composite repair shop was also investigated. (See Figure 3.) The damaged areas were marked for sanding before being repaired to assess the extent of the damage. This component presented itself as an ideal candidate for blasting since coating removal was necessary to inspect around the suspect damaged areas. The coatings were removed by blasting without any substrate damage.

The demonstration verified that eStrip™ GPX, Type VII media is effective for coating removal from composite substrates without inducing damage to the substrate. The benefits gained from this process include:

- Decreased worker fatigue and subsequent chronic physical injuries,
- Reduced risk of substrate damage compared to sanding and blasting with Type V, and
- Improved turnaround time for component for component repair.

Although not yet approved for use at naval maintenance activities, engineers from NADEP Cherry Point are encouraged by the results of this first demonstration of eStrip™ GPX on naval aircraft components. These preliminary engineering efforts will continue, with the end goal of developing a production friendly process that will not only improve working conditions but also decrease the volume of hazardous waste generated. ⚓

CONTACTS

Robert Mehring
Naval Air Depot Cherry Point, NC
252-464-5040
DSN: 451-5040
robert.mehring@navy.mil

Clint Salter
Naval Air Depot Cherry Point, NC
252-464-5339
DSN: 451-5339
clinton.e.salter@navy.mil